Calculations – progression of skills year by year

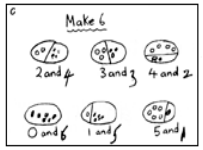
The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document. Although the policy is set out in year groups, it is vital that pupils are taught according to the stage that they are currently working at, **being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on**
It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:

- children should always estimate first
- always check the answer, preferably using a different method eg. the inverse operation
- always decide first whether a mental method is appropriate
- pay attention to language - refer to the actual value of digits
- children who make persistent mistakes should return to the method that they can use accurately until ready to move on
- children need to know number and multiplication facts by heart
- discuss errors and diagnose problem and then work through problem - do not simply re-teach the method
- when revising or extending to harder numbers, refer back to expanded methods. This helps reinforce understanding and reminds children that they have an alternative to fall back on if they are having difficulties.

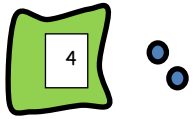
Addition

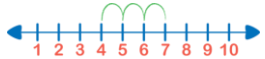
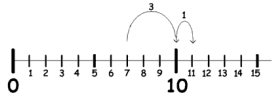
<table>
<tr><th></th><th>Age related expectations</th><th colspan="5">Recording</th><th>Key skills</th></tr>
<tr><td>EYFS</td><td>Addition as combining 2 groups</td><td colspan="3">Children will engage in a wide variety of songs and rhymes, games and activities.
They will begin to relate addition to combining two groups of objects, first by counting all and then by counting on from the largest number.
They will find one more than a given number.
In practical activities and through discussion they will begin to use the vocabulary involved in addition.</td><td>Pictures / Objects

I buy 2 cakes and my friend buys 3 cakes.
How many cakes did we buy altogether?
 
Might be recorded as:
2 + 3 = 5</td><td> 

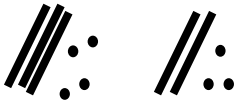
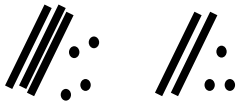
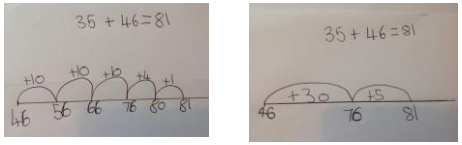
Children who are ready may record this as:
6 = 2 + 4 6 = 3 + 3
6 = 4 + 2 6 = 0 + 6
6 = 1 + 5 6 = 5 + 1
6 is the same as….</td><td>Number recognition 1-10 (F1) 1-20 (F2)
Count 1:1
Form numerals</td></tr>
<tr><td>Year 1</td><td>Addition as ‘counting on’

O + O
(bridging 10)

TO + O
(bridging 20)</td><td>Using pictures and symbols as above</td><td>Children in move from counting all to counting on, have two groups of objects but cover one so that it can not be counted, e.g. 4 + 2 =
 
</td><td>Number line/Number track

4 +3 = 7
 
</td><td>Bridging 10
7 + 4 =
 

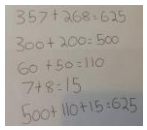
7 jump to café number which is 3 jumps then 1 more to make the 4 land on 11.

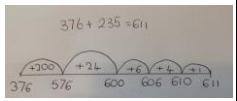
Jumping to 20 when bridging 20</td><td>Pictures and symbols
34 + 23 =
 
34 + 23 = 57</td><td>Read and write numbers to 100 in numerals, incl. 1-20 in words
Recall bonds to 10 and 20, and addition facts within 20
Count to and across 100
Count in multiples of 1 2, 5 and 10
Doubling and halving</td></tr>
<tr><td>Year 2</td><td>TO + O
TO + tens
TO + TO
(bridging 10s / 100)</td><td>Marked number lines above</td><td>Pictures and symbols
34 + 23 =
 
34 + 23 = 57</td><td colspan="2">Empty number lines using efficient jumps
 
</td><td>Partitioning

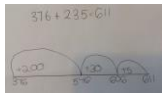
E.g. 23 + 41

23 + 41
20 3 40 1

3 + 1 = 4 Add the units first
20 + 40 = 60 Then add the tens
60 + 4 = 64 Recombine the total

357+ 268
 
</td><td>Show that adding can be done in any order (the commutative law).
Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
Understand the place value of 2-digit numbers (tens and ones)
 Compare and order numbers to 100 using < > and = signs.</td></tr>
</table>

<table>
<tr>
<td>Year3</td>
<td>TO + TO
(bridging 100)
HTO + TO
HTO + HTO</td>
<td>Empty number lines
 

 
</td>
<td>Partitioning larger numbers.

E.g. 358 + 73

300 + 0 = 300
50 + 70 = 120
8 + 3 = 11

300 + 120 + 11 = 431</td>
<td>Expanded horizontal when bridging 100

358 +73=

300 + 50 +8
0 + 70 + 3
300 + 120 + 11 = 431

Should be taught with TO+TO first
'Partition the numbers into tens and units. Add the tens together and then add the units together. Recombine to give the answer.'

Expanded vertical column method

E.g. 358 + 273 =

3 5 8
+ 2 7 3
1 1 (8 + 3) Add the ones first
1 2 0 (50 + 70)
5 0 0 (300 + 200)
6 3 1
When confident, stop using the brackets.</td>
<td>Compact formal written method

No carrying to begin with

564 + 232=

564
+ 232
796

Then carrying the numbers when they cross a barrier.

E.g. 358 + 273 =

3 5 8
+ 2 7 3
1 1
6 3 1

.</td>
<td>Read and write numbers to 1000 in numerals and words.
Add 2-digit numbers mentally, incl. those exceeding 100.
Add a three-digit number and ones mentally (175 + 8)
Add a three-digit number and tens mentally (249 + 50)
Add a three-digit number and hundreds mentally (381 + 400)</td>
</tr>
<tr>
<td>Year 4</td>
<td>HTO + TO
HTO + HTO
(incl bridging 1000)
ThHTO + HTO

Decimals: money
(£7.85 + £3.49)</td>
<td>Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations</td>
<td>Expanded vertical column method

E.g. 358 + 273 =

3 5 8
+ 2 7 3 1 1 (8 + 3) Add the units first
1 2 0 (50 + 70)
5 0 0 (300 + 200)
6 3 1

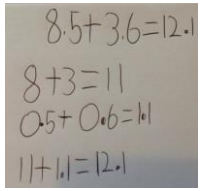
When confident, stop using the brackets.</td>
<td>Compact formal written method

Carrying the numbers when they cross a barrier.

E.g. 1358 + 273 =

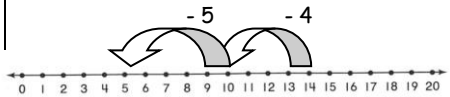
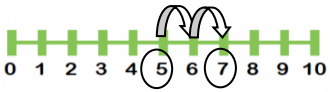
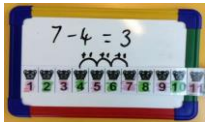
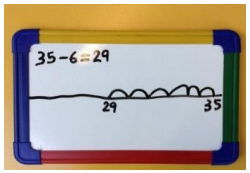
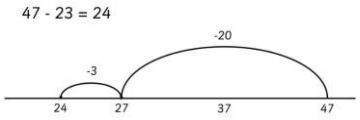
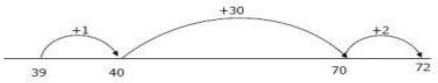
1 3 5 8
+ 2 7 3
1 6 3 1
1 1

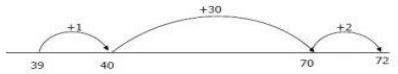
Carrying must happen at the bottom.</td>
<td>Solve problems that include numbers with decimals.

E.g. 8.5 + 3.6
 
</td>
<td>Select most appropriate method: mental, jottings or written and explain why.
Recognise the place value of each digit in a four-digit number.
Round any number to the nearest 10, 100 or 1000.
Continue to practise a wide range of mental addition strategies, ie. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.</td>
</tr>
</table>

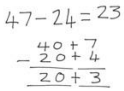
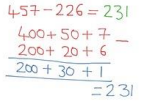
Year 5	ThHTO + HTO ThHTO + ThHTO More than 4 digits Decimals up to 2dp **(23.7+ 48.56)**	Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations	**Compact formal written method** Carrying the numbers when they cross a barrier. E.g. 1358 + 273 = 1 3 5 8 + 2 7 3 1 6 3 1 Carrying must happen at the bottom. See Lancashire PPT to teach place value with in formal method so 'carrying' is understood.	**With Decimals** E.g. 124.9 + 117.25 1 2 4 . 9 **0** Write '0' to help you! + 1 1 7 . 2 5 Remember to line up the digits and decimal points. 2 4 2 . 1 5 Carrying must happen at the bottom.	Lots of opportunities for multistep problem solving	Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds. Use rounding to check answers and accuracy. Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.
Year 6	ThHTO + HTO ThHTO + ThHTO More than 4 digits As year 5 reinforce, consolidate and extend	Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations	**Compact formal written method** E.g. 21848 + 1523 = 23371 21848 + 1523 **23371** Carrying must happen at the bottom.	**With Decimals** £154.75 + £233.82 = £388.57 154·75 + 233·82 **388·57** Carrying must happen at the bottom.	Lots of opportunities for multistep problem solving	Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies. Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

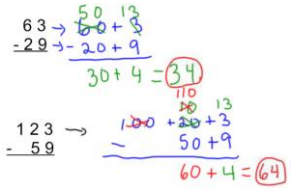
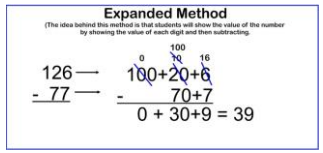
Subtraction

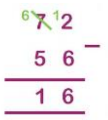
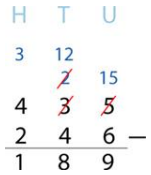
	Age related expectations	Recording				
EYFS	Subtraction as 'take away from a group'	Children will engage in a variety of counting songs and rhymes and practical activities. In practical activities and through discussion they will begin to use the vocabulary associated with subtraction. They will find one less than a given number. They will begin to relate subtraction to 'taking away' using objects to count 'how many are left' after some have been taken away.		Pictures and objects I have 5 cakes. I eat 2 of them. How many do I have left?  Might be recorded as: 5-2= 3	 My sheepdog looked after 8 sheep. 5 got lost. How many left?	Number recognition 1-10 (F1) 1-20 (F2) Count 1:1 Form numerals
Year 1	Subtraction as 'taking away' U – U TO – U (bridging 10) Beginning to count up	Using pictures and symbols as above	Number line/Number track (jumping back) 7 - 3 = 4  	Bridging 10 14-9=  	Counting up 7-5=   	Given a number, say **one more or one less.** Count to and over 100, **forward and back**, from any number. Represent and use **subtraction facts to 20 and within 20.** Subtract with **one-digit and two-digit** numbers to 20, including zero.
Year 2	Subtraction as inverse of addition, subtraction as taking away and as difference (counting on) TO – TO (bridging 10s)	Counting up and back using a number line (as year 1)	Counting back using an empty number line  	Counting back using an empty number line, efficient jumps  	Counting up using empty number line (bald man's head) 72-39= 33 30+2+1= 33  Draw line, write small number and large number. Write nearest café numbers to both numbers. Draw jumps Write the difference between each jump. Add up difference	Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100. Show that subtraction of one number from another cannot be done in any order.

<table>
<tr>
<td>Year 3</td>
<td>TO – TO
HTO – TO
HTO – HTO</td>
<td>Counting up using empty number line (bald man's head)
72-39= 33
 

30+2+1= 33

Draw line, write small number and large number.
Write nearest café numbers to both numbers.
Draw jumps
Write the difference between each jump.
Add up difference</td>
<td>Expanded method no exchanging
TO – TO
 
HTO – HTO
 

Expanded method with exchanging
 
 
</td>
<td>Begin formal compact method no exchanging
 

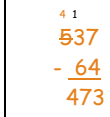
Begin formal compact method with exchanging
 
  </td>
<td>Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds.

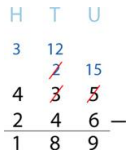
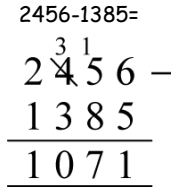
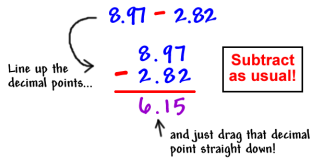
Find 10 or 100 more or less than a given number.

Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.</td>
</tr>
<tr>
<td>Year 4</td>
<td>HTO – TO
HTO – HTO
ThHTO-HTO
ThHTO-ThHTO

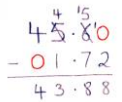
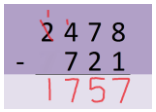
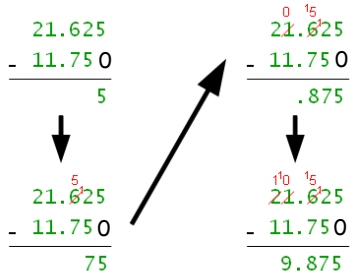
Decimals: money (£7.85 - £3.49)</td>
<td>Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations</td>
<td>Formal compact method no exchanging

567-24=
 

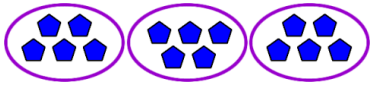
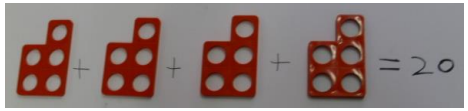
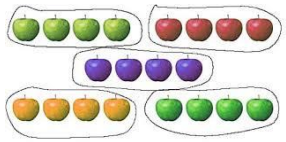
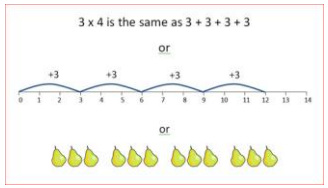
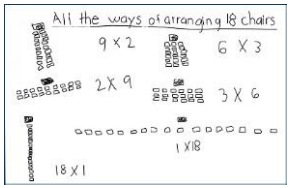
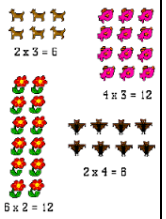
567-324=
 
</td>
<td>Formal compact method with exchanging
537-64=
 

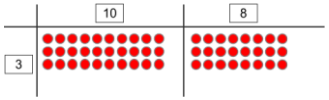
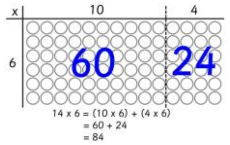
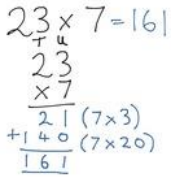
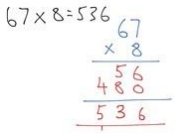
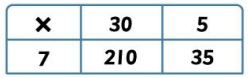
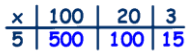
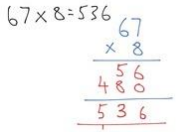
435-256=
 
2456-1385=
 
</td>
<td>Solve problems that include numbers with decimals.
 
</td>
<td>Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.

Children select the most appropriate and efficient methods for given subtraction calculations.</td>
</tr>
</table>

Year 5	ThHTO – HTO ThHTO-ThHTO Decimals up to 2dp (72.5 – 45.7)	Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations	Formal compact method no exchanging 5357-214= 5367 - 214 5153 5367 - 3124 2243	Formal compact method with exchanging 2456 – 1385 = 1071 8000 – 673 = 7327	Using decimals  Remember to use '0' as a place holder to line up decimals correctly.	Lots of opportunities for multistep problem solving	Subtract numbers mentally with increasingly large numbers . Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
Year 6	More than 4 digits Consolidate / extend Y5 including: Decimal to 3 dp relating to measures	Continue to use number lines with larger number and decimals where appropriate as jottings for mental calculations	Formal compact method  2456 – 1385 = 1071 5534367 - 344124 5290443	Using decimals 	Lots of opportunities for multistep problem solving There we 2.5 litres in the jug. I drank 385ml. How much was left?		Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why. Use negative numbers in context, and calculate intervals across zero.

Multiplication

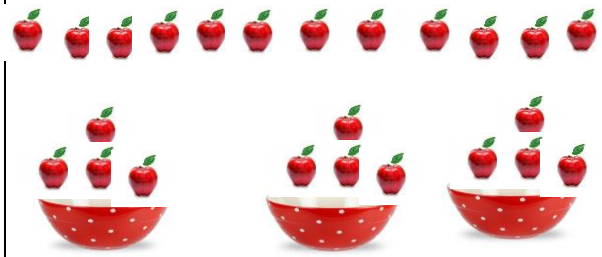
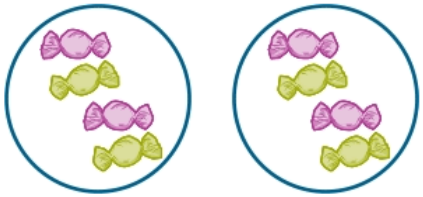
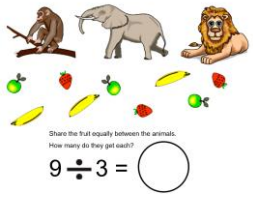
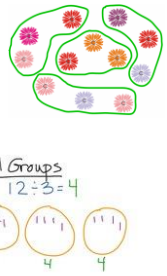
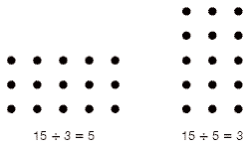
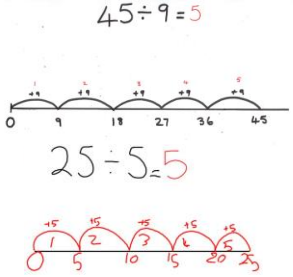
	Age related expectations	Recording			
EYFS	Count repeated groups of the same size (1s / 2s / 5s / 10s)	They should experience practical calculation opportunities involving equal sets or groups using a wide variety of equipment, e.g. small world play, role play, counters, cubes etc.	Using pictures objects  **3 plate, 2 cakes on each plate.**		Number recognition 1-10 (F1) 1-20 (F2) Count 1:1 Form numerals To be able to make groups
Year 1	Solve (practical) problems that involve combining groups of 2, 5 or 10	There are 3 pots, each pot has 5 flowers. How many flowers altogether? 	There are 3 groups of 5. How many altogether? 	Repeated addition using pictures/objects   2+2+2=6	Count in multiples of 2, 5 and 10. Use pictures and concrete objects to solve multiplication problems. Make connections between arrays, number patterns, and counting in twos, fives and tens.
Year 2	Multiplication as repeated addition and arrays	5x5= 25 5 groups of 5 	Repeated addition on a number line.  	Arrays  	Count in steps of 2, 3 and 5 from zero, and in 10s from any number. Recall and use multiplication facts from the **2, 5 and 10** multiplication tables, including recognising odds and evens. Write and calculate number statements **using the x and = signs**. Show that multiplication can be done in any order (commutative).

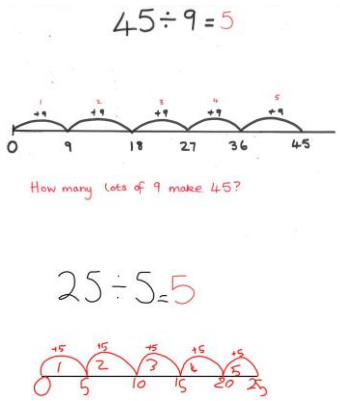
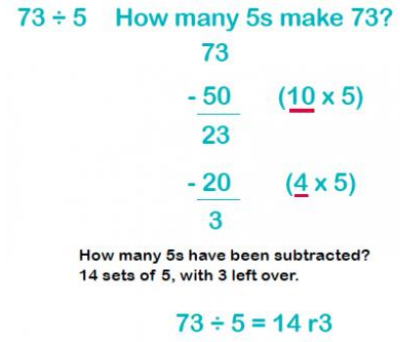
Year3	TO x U (eg 13 x 4)	Looking at images of arrays and partitioning the two digit numbers which will get children ready for the grid method   	Grid method 35x7=  **210 + 35 = 245**	Vertical expanded method TO x U   	Begin formal written method 23x7= 23 7 +2 161 67x8= 67 8 +5 536	Recall and use multiplication facts for the **2, 3, 4, 5, 8 and 10** multiplication tables, and multiply multiples of 10. Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) Solve multiplication problems, including missing number problems.
Year 4	Record, support and explain: TO x U HTO x U	Revise grid method 30x7=  **210 + 35 = 245** HTO x U **123 x 5**  500 + 100 + 15 615	Revise vertical expanded TO x U  HTO x U 356 x 7= 356 × 7 42 ← 7 × 6 350 ← 7 × 50 2,100 ← 7 × 300 2,492	Teach formal written method 356 x 7= 356 7 2492 3 4 Carrying must happen at the bottom. Th H T U 9 3 4 x 6 5 6 0 4 2 2 934 x 6 = Your Answer	Count in multiples of 6, 7, 9, 25 and 1000 Recall multiplication facts for **all multiplication tables up to 12 x 12.** Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multi-ply 3 numbers.

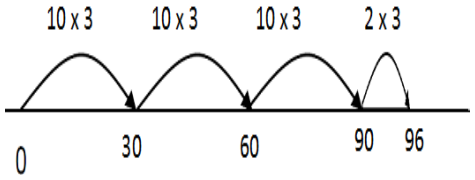
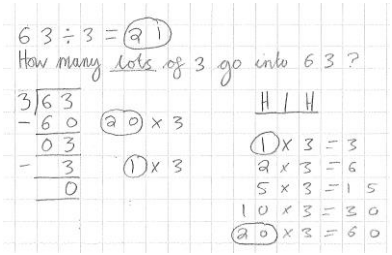
Year 5	Refine and use efficient methods: ThTOxO HTO x U (Short multiplication) O.t x O HTO x TO ThHTO xTO Long multiplication	Revise grid method 35x26= 600 + 100 = 700 180 + 30 = 210 700 + 210 = 910 HTO x O 123 x 5 500 + 100 + 15 615 O.t x O With decimals 2.3x6= 13.8	Revise vertical expanded HTO x O 356 x 7= 356 × 7 42 ← 7 × 6 350 ← 7 × 50 2,100 ← 7 × 300 2,492 TO x TO 22x34 22 x 36 12 (6 x 2) 60 (30 x 2) 120 (6 x 30) 600 (30 x 20) 792	Focus on formal written method HTO x O (short multiplication) 356 x 7= 356 7 2492 HTO x TO (long multiplication) 122 x 36= 122 36 732 + 3660 4392 ThHTO xTO Long multiplication 1322 x 52= 1322 52 2644 + 66100 68744 Carrying must happen at the bottom.	Identify multiples and factors, using knowledge of **multiplication tables to 12x12.** Solve problems where larger numbers are decomposed into their Factors. Multiply and divide integers and decimals by 10, 100 and 1000 ▯ Recognise and use square and cube numbers and their notation .

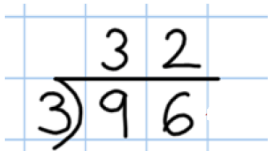
Year 6	Use efficient methods: Integer x O (eg 2307 x 8) Decimal x O (eg 31.6 x 7) HTO x TO THTO x TO	Revise informal methods	Focus on formal written method Decimal x O 21.2 x 6= 21.2 6 127.2 ThHTO xTO Long multiplication 1322 x 52= 1322 52 2644 + 66100 68744 HTO x TO 521 x 22 1042 10420 11462 Carrying must happen at the bottom.	Lots of opportunity for problem solving in different contexts	Identify multiples and factors, using knowledge of **multiplication tables to 12x12.** Use rounding and place value to make approximations before calculating and use these to check answers against.

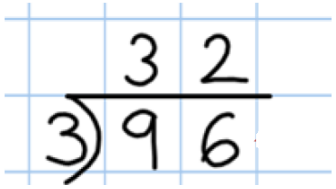
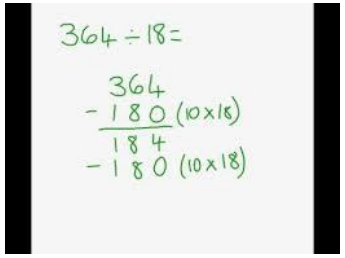
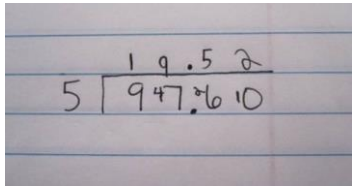
Division

	Age related expectations	Recording				
EYFS	Share objects into equal groups and count how many in each group	Pupils should have many practical experiences of sharing objects e.g. sharing between 2 people, or finding ½ of a group of objects. Pictures should be introduced as a next step to represent this. Use vocabulary- sharing equally, fairly, evenly	Drawings and diagrams should be increasingly used to represent and demonstrate sharing. **6 cakes shared by 3 children** 			Number recognition 1-10 (F1) 1-20 (F2) Count 1:1 Form numerals To be able to share.
Year 1	Solve (practical) problems that involve sharing into equal groups and grouping	I have 12 apples and 3 bowls. How many apples can be shared into each bowl? 	There were 8 sweets. I put them in groups of 4. How many groups did I make?  4 4 2 groups of 4			Use pictures and concrete objects to solve multiplication problems. Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities. They make connections between arrays, number patterns, and counting in twos, fives and tens.
Year 2	Division as sharing and grouping (including remainders) TO U (where divisor is 2, 5 or 10)	Sharing  9 ÷ 3 = ◯ 4 5 3	Grouping  Equal Groups 12 ÷ 3 = 4 4 4 4	Arrays/informal jottings  15 ÷ 3 = 5 15 ÷ 5 = 3	Using number lines with and without remainders  45 ÷ 9 = 5 25 ÷ 5 = 5	Count in steps of 2, 3, and 5 from 0 Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs.

<table>
<tr>
<td>Year3</td>
<td>TO÷ U
(where divisor is 2, 3, 4, 5, 6 or 10)
Round remainders up /down, depending on the context</td>
<td>Using number lines with and without remainders
 
</td>
<td>Chunking
 
</td>
<td>Chunking with remainders

72 ÷ 5
72
- 50 (10 x 5)
22
- 20 (4 x 5)
2
Answer : 14 remainder 2</td>
<td>Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables</td>
</tr>
<tr>
<td>Year 4</td>
<td>Record, support and explain:
TO÷U
(eg 98÷ 6)</td>
<td>Number line
 
</td>
<td>Chunking more efficiently
  </td>
<td>Introduce

Short division: Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).
  </td>
<td>Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.</td>
</tr>
</table>

Year 5	Refine and use efficient methods: HTO ÷U ThHTO ÷ U	Chunking 6)196 − 60 6×10 136 − 60 6×10 76 − 60 6×10 16 − 12 6×2 4 32 Answer: 32 R 4	Short division: Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).  (start off a few with 2 digit them move on to 3 and 4) **(bus stop method)** **3143** **2 6286**	**Introduce short division (bus stop method)** with carrying (start off a few with 2 digit them move on to 3 and 4) 12 8 ⟌ 916  **3644 r1** **1** **2 ⟌ 7289**	Recall multiplication and division facts for all numbers up to 12 x 12 Multiply and divide numbers mentally, drawing upon known facts. Work out whether a number up to 100 is prime, and recall prime numbers to 19.
Year 6	Use efficient methods: HTO ÷ TO (eg 123 ÷7) Decimal ÷ U (eg 27.6 ÷8) ThHTO ÷ TO	Revise chunking  	Short division 15.8 5 ⟌ 7²9.⁴0  	Introduce long division 34 2⟌68 -6 08 -8 0 015 32⟌487 -0 48 -32 167 -160 7 0.5 5⟌2.5 -0 25 -25 0 77r35 47)3654 329 364 329 35 362 15⟌5,430 -45 93 -90 30 -30 0	Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations Perform mental calculations, including with mixed operations and large numbers. Identify common factors, common multiples and prime numbers.